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THE FIRST AND ONLY

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Dear Sir:

A low-cost, low-power, nuclear reactor for research purposes has been successfully designed by North American Aviation, Downey, Calif., under a USAEC contract. Development work on the components for such a reactor is now underway, at North American, with completion scheduled for July, 1952. Construction costs are currently estimated to be about $1 million. The design calls for an octagonal shaped reactor to be operated at an energy rate equivalent to 160 kilowatts. The core consists of graphite and enriched uranium, sealed in an aluminum tank, all of which is surrounded by a graphite reflector. The top and bottom of the reflector, and six of the eight surfaces of the octagon, are shielded by concrete to protect operating personnel from radiation. The reflector graphite is continued beyond a bismuth shield to the other two reactor faces. A removable cadmium and lead shield at these latter sides provides access to thermal neutrons diffusing through the graphite. Cooling will be with heavy water. About a dozen exposure holes, which may be fitted around the core, will provide neutron flux for experimental purposes; such a reactor may also be a source of short lived isotopes for research centers located some distance from the present sources--Oak Ridge National Laboratory, Tennessee, and Brookhaven National Laboratory, New York.

Construction of the second unit of the biology laboratory building, to make available additional research facilities for using radiation and radioisotopes, has now begun at Brookhaven National Laboratory, Upton, New York. To cost approximately $1 million, the building will house laboratories for animal physiology, biochemistry, biophysics, with others for special operations.

A radioisotope laboratory has now been added to the facilities of the research laboratories of E. R. Squibb & Sons, New Brunswick, N. J. , Dr. A. F. Langlykke, Squibb's director of research and development announced last week. The unit will be headed by Dr. Paul Numerof.

Applications for USAEC graduate fellowships in radiological physics for the 1952-3 school year are now being received by the Oak Ridge Institute of Nuclear Studies. Appointments are for one year for specialized training in radiological physics. Information may be obtained from the Institute, P.O. Box 117, Oak Ridge, Tenn.

An estimate of three million casualties, including 900,000 dead among the civilian population, should an atomic war be directed against the United States in 1952, has now been made by Dr. Norvin Kiefer, director of the Health and Special Weapons Division of the Federal Civil Defense Administration, Washington. Dr. Kiefer, who based these figures on the results of the atomic bombing of Japan during World War II, gave this warning to delegates at the National Medical Civil Defense in Chicago, last fortnight. Dr. Kiefer predicted that of the 2,100,000 who might be injured, about 60% would suffer from burns, 50% would suffer shock, and 20% would sustain some degree of radiation sickness.

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NEW PRODUCTS, PROCESSES & INSTRUMENTS...in the nuclear field...

Based upon work of its president Philip E. Ohmart, The Ohmart Corporation, Cincinnati 38, Ohio, intends to produce nuclear instruments utilizing principles discovered by Mr. Ohmart, and which are the subject of a Government patent, now pending. According to the inventor, his patent covers the conversion of radioactive energy to electrical energy by constructing a cell made of two dissimilar materials separated by a filling gas. When the resulting cell is connected to a current measuring device, and the filling gas is forcibly ionized by exposure to nuclear radiation, the positive ions formed in the gas are attracted to the noble electrode, and the electrons are attracted to the active electrode, resulting in the generation of an electrical current. Mr. Ohmart states his work has shown that besides being useful for the measurement of nuclear radiation, this phenomenon also can be used for corrosion measurement, analysis of alloys, gas analysis, and measurement of vacuum, pressure, and temperature.

New respirator, designed primarily to protect workmen exposed to oxides of beryllium; radioactive dusts; and similar hazardous particulate matter. Called the "Comfo Ultra-Filter" Respirator, it is said to have a filter efficiency of 99.99% against particles 0.30 micron in size. The new respirator uses the "Ultra Filter" which the manufacturer claims to be the most efficient mechanical filter commercially available. It is composed of filter material which contains a high percentage of special asbestos fibers. When this is assembled in the several metal bound layers (which make up the "Ultra Filter"), it presents a very large surface area, which is said to have low resistance to breathing. The filter assembly is replaceable. The cushion facepiece of the respirator has been especially designed to afford a quick, gas-tight fit, regardless of facial shape or size. A bridge strap provides automatic adjustment of the facepiece across the nose, while a guarded exhalation valve affords low exhalation resistance. Suggested uses for this new respirator are in plant protection and civilian defense programs, and for emergency requirements against airborne radioactive dusts and bacterial organisms. The respirator also fits under all types of welding helmets. --Mine Safety Appliance Co., Pittsburgh 8, Pennsylvania.

Standard solutions of Phosphorous-32 and Iodine-131 have now been added by the National Bureau of Standards to its list of standard samples available for general distribution to investigators in physics, chemistry, medicine, and industry. The program was initiated on a limited basis early in 1946, and is now expanded to operate on a periodic schedule. P-32 is distributed during March and September, and I-131 during January and June. These new standards bring to a total of 9 the number of radioactive standards distributed or calibrated by NBS. The radioisotopes P-32 and I-131 have been employed extensively for diagnosis and therapy in brain surgery, leukemia, and other types of cancer. In the early use of these tagged atoms, variations in the results obtained by different laboratories amounted to as much as 100 and 200 per cent of the accepted value. The procedure that has now been established will permit the duplication of research results at different laboratories and installations. The P-32 and I-131 standards consist of a flame-sealed sterilized glass ampoule containing the active isotope in approximately 3 milliliters of dilute carrier solution. The exact disintegration rate per milliliter as of the zero date is noted, and is roughly 100,000 disintegrations per milliliter. These standards, because of their low activity, are exempt from Federal regulations regarding the possession, use, and transfer of radioactive materials. The other NBS standards include radium gamma ray standards, radium solution for radon calibrations, calibrated radioactive ore samples, cobalt-60 beta and gamma ray solution standards, carbon-14 beta ray solution standards, and neutron flux standards. Inquiries concerning these standards should be made to the Radioactivity Section, National Bureau of Standards, Wash. 25, D. C.

NOTES: A new twelve page illustrated catalogue has now been issued by Radiation Counter Laboratories, 5122 W. Grove St., Skokie, Ill., which may be obtained from this company on request. Included are this firm's scalers, Nucelometers, rate meters, scintillation counters, scintillation crystals, water monitors, etc.

BUSINESS BRIEFS...in the nuclear energy field...

Contract renewal - Monsanto Chemical Co. has now been granted a four and one-half year renewal of its contract with the USAEC for Monsanto's operation of Mound Laboratory, Miamisburg, Ohio, and Scioto Laboratory, Marion, Ohio. The new contract covers operation and maintenance of the two laboratories which are engaged in research and development work in the nuclear energy field.

New plant - A new plant with greatly enlarged facilities has been erected by Radiation Counter Laboratories at 5122 West Grove St., Skokie, Ill.

Construction bids asked - Plans and specifications have now been issued by the USAEC's Idaho Operations Office (Idaho Falls) for construction of additions to two buildings and the remodeling of another structure at the Reactor Testing Station, Arco, Idaho. Inquiries should be made to the USAEC Contract Coordinator, at Idaho Falls, Idaho.

RAW MATERIALS...radioactive minerals for nuclear work...

UNITED STATES-New Mexico: Laguna Indians are reported to have found a uranium mineral deposit on their reservation, halfway between Grants--site of the first such find here in New Mexico--and Albuquerque. The discovery is said to be an extension of the Grants uranium field...The Santa Fe railroad has now set up the Haystack Mountain Development Co. to mine uranium ore recently discovered on company property near Grants, N.M. Haystack is now negotiating with Anaconda Copper for the sale and delivery of its ore; Anaconda has requested permission from the USAEC to construct a mill to process the ore. (Rock bearing uranium ore was discovered on Santa Fe land early this year by a 59-year old Navajo sheep raiser, one Paddy Martinez. The deposit was found to be of sufficient quality and quantity to justify mining, Santa Fe officials stated.) South Dakota: Possibility that uranium minerals in commercial quantity may exist in the Black Hills area is seen in an announcement that carnotite was discovered near Edgemont, S.D. J. Brennan, of Rapid City, who made the announcement, said the discovery was made in Craven canyon, about 10 miles north of Edgemont, in the Harney National Forest. Mining men in the southern Hills are not overly excited about the possibility. It has been long known that radioactive minerals were present in the foothills of the Black Hills. Some two years ago an extensive development was started at Sundance, Wyo., but to date has not yielded paying quantities of uranium ore.

CANADA - A new recovery process, employing a basic leach under conditions of high temperature and pressure, will be the method used for uranium refining in the 500-ton mill at Eldorado Mining and Refining's Beaverlodge operation north of Lake Athabaska in northern Saskatchewan, according to company officials. It is planned to have this new plant in operation during the first quarter of 1953. R. M. Way & Co., Toronto, has been engaged as general consultant on design of the flow sheet and leaching process. Foster-Wheeler, Ltd., St. Catharines, is providing the heat exchange equipment.

NEW BOOKS & OTHER PUBLICATIONS...in the nuclear field...

Biological Effects of External Beta Radiation. Edited by R. E. Zirkle. Number IV-22E in the National Nuclear Energy Series. 242 pages.--McGraw-Hill Book Co., New York 18 ($3.25)

Flame Photometric Analysis, by K. Saddington, W. Fullwood, and A. M. Smales. (Microfilm $2.00)...Refrigerated Oil Diffusion Pump Baffle, by R. S. Barton, (Microfilm $1.75)...Application of the Hollow Cathode Source to Spectrographic Analysis, by F. T. Birks. (Microfilm $1.75)...Mode-Separation Theory for Heavily Strapped Magnetrons, by A. W. Aikin. (Microfilm $1.75)...Preparation and Use of Pile-Made Gamma Sources for Industrial Radiography, by W. S. Westwood (Microfilm $1.25)... Preparation of Diborane, by F. Hudswell, J. S. Nairn, and K. L. Wilkinson. (Microfilm $1.75)...These papers represent work of the Atomic Energy Research Establishment, Harwell (England). They are available from the Library of Congress Photoduplication Service, Washington 25, D.C.

Detection of Alpha Contamination with Scintillation Counters, by G. Cowper. --National Research Council of Canada, Ottawa, Canada (20¢)

URANIUM FROM PHOSPHATE ROCK: A special digest of remarks by Sheldon P. Wimpfen, Div. of Raw Materials, USAEC, as delivered before National Fertilizer Assoc., Atlanta, Ga., Nov. 14, 1951.

Like gold, uranium is where you find it. Most of the free world's supply comes from the Congo, Colorado, and Canada. Only a few years ago, it was discovered that small amounts were present in the Florida Bone Valley formation, and in the Phosphoria formation of the western states.

Although the amount of uranium present in most marine phosphate rock is on the order of 0.2 to 0.4 of a pound per ton of rock, when one considers the large tonnages of phosphate rock mined annually, the recovery of the uranium becomes an objective of some importance.

Research projects to develop methods for recovering the uranium, sponsored by the USAEC, have been undertaken at MIT, Battelle Memorial Institute, and the Dow Chemical Company. These were comprehensive efforts to find a means of uranium recovery that would permit production of uranium as a by-product in the course of manufacturing commercial fertilizer materials.

Preliminary studies indicated that recovery from wet-process phosphoric acid might be the easiest; therefore, research was aimed in that direction. It was found that most of the uranium in the phosphate rock was dissolved when rock was treated with an excess of sulphuric acid. When the slurry was filtered, the bulk of the uranium was found in the phosphoric acid. There was, however, one major drawback to development of a uranium production method based on wet-process phosphoric acid. Only about 1,000,000 tons of phosphate rock per year were used in commercial plants to make wet-process acid. As the tonnage of rock to make normal superphosphate is much larger, research continued to seek a means of recovering uranium from normal superphosphate. By the Summer of 1950, a number of recovery schemes had been examined. One, which was found acceptable, was put into pilot plant operation. To better answer the technical and economic questions that arose, a larger unit was built in Florida in cooperation with a major commercial producer of phosphoric acid. This larger unit has been operating for several weeks. Data developed at this plant should guide us in recovering uranium in full-size plants.

At the same time that this pilot plant is in operation, a full scale production plant is being constructed to recover uranium from the wet-process phosphoric acid made by one of the largest producers of phosphate chemicals in the United States. This unit will use a uranium production process that has proven eminently successful in semi-plant scale operations, worked into the manufacturing process of this particular plant. Other pilot plants are in operation to develop design data for full-scale plants.

We feel that a three-fold objective of uranium production, output of higher analysis fertilizers, and maintenance of existing distribution facilities, can be attained. If phosphoric acid were produced for sale as made, it could be effectively utilized in many areas, and with existing equipment. If uranium were to be recovered from this phosphoric acid, the barren acid could then be delivered by tank-truck or railway car to the normal superphosphate plants in the radius that could be economically served. These normal super producers could substitute phosphoric for a portion of the sulphuric acid now used, and would make a higher analysis fertilizer.

The first production plant to recover uranium from phosphoric acid is now under construction by the Blockson Chemical Co., at Joliet, Ill. Another sodium phosphate chemical producer, the General Chemical Division, Allied Chemical & Dye Corp., is in the pilot plant stage preliminary to the construction of a by-product recovery plant. In the fertilizer field, U. S. Phosphoric Products Div. , Tennessee Corp., is piloting a technically feasible process to determine the operating characteristics of the uranium recovery method and the economics of production. Mathieson Chemical Corp. is nearing completion of research that will lead to the operation. of a pilot plant to determine the design, specifications, and costs of a full-scale production plant. Armour Fertilizer Works is engaged in efforts to apply selected research data to the recovery of uranium. New plants to make wet-process acid have been announced by International Minerals & Chemical Corporation, and Virginia-Carolina Chemical Corp., that will incorporate uranium recovery facilities.

IONIZING RADIATION...investigating & notes...

Ferritin, an iron-bearing protein associated with the iron transport system in the human body, has been found to be released in the bloodstream in appreciable quantities after exposure to X-radiation, according to T. J. Haley, atomic energy project, University of California (Los Angeles) Medical School. The studies on ferritin were made with rats exposed to X-rays over their entire body, or over the liver. The protein does not seem directly related to the death rate of the exposed animals, however, since very few die during the interval in which there is a high content of ferritin in the blood--the third day after irradiation. Most of the animals died from over-all damage produced by the X-radiation.

Studies have now been made of the effects of X-rays on colored plastics, by M. J. Day, Radiotherapy Department, Royal Victoria Infirmary, Newcastle upon Tyne (England) and Gabriel Stein, Kings College, University of Durham, Newcastle upon Tyne. The studies were a continuation of earlier work by these investigators on systems suitable for the dosimetry of ionizing radiations. It was found that of a series of thirty-two samples of commercially available polymethylmethacrylate (known by the trade name of Perspex) colored with various materials, three samples showed an appreciable change of color when irradiated with X-rays. These color changes were found to be more intense than the slight color changes shown by uncolored Perspex, and of a different spectral composition. In addition, they were found to be completely different from the slight bleaching caused in the same materials by ultra-violet light.

A cobalt-60 therapeutic "bomb", which can emit a one-inch beam with an intensity of 1,500 curies, has now been installed at the Victoria Hospital, London, Ontario (Canada, for use there at the London Clinic of the Ontario Cancer Foundation. A similar cobalt-60 bomb has also been delivered to the Saskatchewan Cancer Commission, in Saskatoon. These two are the first cobalt-60 therapeutic sources produced at the NRX pile at Chalk River, Ontario, the high flux water and uranium nuclear reactor. (The NRX pile has been operating for about 4 years. It is situated on the south bank of the Ottawa river, about 125 miles west-north-west of Ottawa. The reactor vessel is a cylinder about ten feet high by eight feet in diameter through which pass vertical tubes containing a total of 176 uranium metal rods, cooled by water from the river. It is in the core of the pile itself that irradiations in the highest neutron fluxes available may be made. The cobalt-60 sources were made here, by irradiating cobalt metal. Radio-cobalt has a half life of 5.3 years and the high neutron flux in the reactor produces in 18 months irradiation of metallic cobalt a specific activity of 55 curies per gram. This makes the self-absorption of the 1.1 and 1.3 Mev gamma-rays in a source, even as large as 1500 curies, relatively small, and it is expected that these sources will be used to replace million-volt X-ray machines for certain purposes, particularly for therapuetic work in hospitals. However, even the large number of neutrons available in the pile is insufficient to meet the demand for such radio-cobalt sources. One of the cobalt-60 sources now under irradiation here will be used in the M. D. Anderson Hospital, Houston, Texas. Of interest is the new NRU reactor, which upon completion at Chalk River will provide Canada with additional nuclear research facilities.)

Notes -- "Radiation Shielding" will be a paper presented by R. Stephenson, Oak Ridge National Laboratories, at the annual meeting of the American Institute of Chemical Engineers, Atlantic City, N.J., Dec. 2-5, 1951. Stephenson will discuss fundamentals of radiation shielding, as well as demonstrate with a portable Geiger counter. Analogies between this field and chemical engineering will be pointed out in the hope that chemical enginners will not be afraid to handle shielding design problems. A 25 minute film "Engineering for Radioisotopes" will also be shown. A symposium on "Heat Transfer", in two sessions, during which sixteen papers will be presented, will be part of this meeting. Papers presented will include work sponsored by the USAEC, as part of its investigations in connection with utilization of heat from nuclear reactors.

Sincerely,

The Staff,
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